AMENDMENTS TO THE SPECIFICATION:

Page 1, please add the following new paragraphs before paragraph [0001]:

[0000.2] CROSS REFERENCE TO RELATED APPLICATIONS

[0000.4] This application is a 35 USC 371 application of PCT/DE 2004/001300 filed on June 22, 2004.

[0000.6] BACKGROUND OF THE INVENTION

Please add the following new paragraphs after paragraph [0001]:

[0001.4] This invention is directed to an improved servo valve of the type employed, for example, for actuating a pressure booster of a fuel injector.

[0001.6] Description of the Prior Art

Please delete paragraph [0003].

Page 3, please replace paragraph [0007] with the following amended paragraph:

[0007] ~~Summary of the Invention~~

SUMMARY OF THE INVENTION

Please replace paragraph [0008] with the following amended paragraph:

[0008] To assure an exact, fast closing motion of a control valve for **a** pressure booster, the control valve is embodied as a slide valve with a pressure shoulder. The valve piston of the slide valve proposed according to the invention may be constructed in two parts, so that it does not have a double guide and can be produced relatively simply. Only two guides of different diameter are needed. The dividing point of the two-part valve piston is located in a low-pressure chamber, while conversely both face ends of the valve piston parts are each

subjected to high pressure, so that a separation of the valve piston is precluded. Because of the pressure shoulder embodied on the slide valve, the valve is closed via hydraulic forces, so that it is unnecessary to generate a strong spring force. This in turn has the advantage that the valve proposed according to the invention can be accommodated without difficulty in the available installation space in fuel injectors.

Page 4, please replace paragraph [0011] with the following amended paragraph:

[0011] As an alternative to embodying the control valve as a 3/2-way slide~~-slide~~ valve with only one guide portion, which in the state of repose of the fuel injector is subjected to rail pressure, an additional valve seat can be employed to further reduce leakage losses. This additional valve seat may be embodied as a flat seat, and it is structurally simple to provide inside a two-part valve housing, which is also favorable in terms of production costs. Moreover, if a 3/2- way slide valve with a flat seat is used as a control valve for the pressure booster, the efficiency of a fuel injector can be increased considerably. The requisite guide lengths and the valve stroke can be reduced further, which overall contributes to reducing the space required for the proposed 3/2-way slide valve. This assures that the embodiment of the present invention will be used in the target installation space of modern internal combustion engines, where only little installation space is available. Embodying the servo valve as a 3/2-way slide-slide valve with a flat seat makes it possible to achieve a leakage-free servo piston, with which furthermore a predeterminable switching sequence upon valve closure can be realized, to make a postinjection at an elevated pressure level possible.

Please replace paragraph [0012] with the following amended paragraph:

[0012] For all the variants of the servo valve proposed according to the invention, two control edges are used for controlling the pressure booster. The control edges (slide seal) are embodied such that upon closure, a ~~lateral~~ **time** delay between closure of the one and opening of the other of the control edges occurs and is exploited for building up a pressure cushion.

Page 5, please replace paragraph [0013] with the following amended paragraph:

[0013] ~~Drawing~~ **BRIEF DESCRIPTION OF THE DRAWINGS**

Please replace paragraph [0014] with the following amended paragraph:

[0014] The invention will now be described in further detail **herein below,** in conjunction with the ~~drawing.~~ **drawings, in which:**

Please delete paragraph [0015].

Please replace paragraph [0016] with the following amended paragraph:

[0016] Fig. 1[[,]] **is a schematic view, in section, of** a first ~~variant~~ embodiment of a servo valve with a pressure shoulder, for triggering a pressure booster of a fuel injector;

Please replace paragraph [0017] with the following amended paragraph:

[0017] Fig. 2[[,]] **is** a ~~variant~~ **second** embodiment of the servo valve shown in Fig. 1, embodied as a slide valve, with a further hydraulic chamber acted upon via the differential pressure chamber;

Please replace paragraph [0018] with the following amended paragraph:

[0018] Fig. 3[[,]] a further ~~variant~~ embodiment of a servo valve, embodied as a slide valve, for triggering a pressure booster, shown in the state of repose;

Please replace paragraph [0019] with the following amended paragraph:

[0019] Fig. 4[[,]] the ~~variant~~ embodiment shown in Fig. 3 of a servo valve embodied as a slide valve, with the pressure booster activated;

Please replace paragraph [0020] with the following amended paragraph:

[0020] Fig. 5[[,]] **is** a further ~~variant~~ embodiment of a servo valve embodied as a slide valve, with a multi-part servo valve housing and a flat seat embodied in it, in the state of repose; and

Please replace paragraph [0021] with the following amended paragraph:

[0021] Fig. 6[[,]] the ~~variant~~ embodiment shown in Fig. 5 of a servo valve embodied as a slide valve, with the pressure booster activated.

Page 6, please replace paragraph [0022] with the following amended paragraph:

[0022] ~~Variant Embodiments~~

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Please delete paragraph [0023].

Please replace paragraph [0024] with the following amended paragraph:

[0024] **Fig. 1 shows a servo valve, embodied as a slide valve, for triggering a pressure booster of a fuel injector.** Via a high-pressure source 1, which may be either a high-pressure collection chamber (common rail) or a high- pressure fuel pump, a pressure booster 2 is acted upon by fuel that is at high pressure. The pressure booster 2 includes both a work chamber 4 and a differential pressure chamber 5, which are separated from one another by a booster piston 3. The pressure booster 2 furthermore includes a compression chamber 6[[. From it,]]

from which a high-pressure line 8 branches off. **A** [[,]] ~~and a~~ check valve 7 is received in the refilling branch of the pressure booster 2.

Page 7, please replace paragraph [0026] with the following amended paragraph:

[0026] A control chamber 29 of a servo valve 23 is also supplied with fuel at high pressure from the high-pressure source 1, via a supply line 22. The servo valve 23 can be actuated by triggering of a switching valve 24, which on its outlet side discharges into a third return 25 on the low- pressure side. Between the second switching valve 24 and the control chamber 29 of the servo valve 23, a second outlet throttle 27 may be connected. A stop 30 for a face end 28 of a second servo valve piston 33 is also received in the control chamber 29. In the exemplary embodiment of a servo valve shown in Fig. 1, a first piston 32 and a second piston 33 are received in the housing of the servo valve 23. The second piston 33 has a larger diameter, compared to the diameter of the first piston 32. The second piston ~~3 is~~ **33 may be** acted upon by a valve spring 31 received in the control chamber 29 of the servo valve 23.

Please replace paragraph [0027] with the following amended paragraph:

[0027] A first hydraulic chamber 34, which has a branch to a fourth low-pressure-side return 35, is located below the second piston 33 in the valve housing of the servo valve 23. A second hydraulic chamber 38 is located below the first hydraulic chamber 34 and is hydraulically in communication with the differential pressure chamber 5 of the pressure booster 2 via a connecting line 43. Between the second hydraulic chamber 38 and a third hydraulic chamber 42, the first piston 32 has an asymmetrically embodied portion. This portion is embodied with an overlapping length **forming a flow conduit** 41 and uncovers a

flow cross section from the second hydraulic chamber 38 into the third hydraulic chamber 42. In the upper region of the first piston 32, below the contact face on the lower face end of the second piston 33, the first piston has a first overlapping length 37 (h_1). In the region of the first hydraulic chamber 34, the difference in diameter between the second piston 33 and the first piston 32 forms a pressure shoulder, which is located above a first sealing seat 36. Toward the valve housing, in the lower region of the first piston 32, a sealing edge 40 is embodied as a slide seat. The hydraulic chamber 42 is acted upon by fuel at high pressure via an overflow line 39, which branches off from the supply line 22 for filling the control chamber 29 of the servo valve 23. The face end of the first piston 32 surrounded by the third hydraulic chamber 42 is identified by reference numeral 44.

Page 8, please delete paragraph [0028].

Please replace paragraph [0029] with the following amended paragraph:

[0029] **Fig. 2 shows a modification of the fuel injection system shown in Fig. 1, including a pressure booster and a fuel injector.** In a distinction from what Fig. 1 shows, a connecting line portion 46 branches off from the connecting line 43 of the differential pressure chamber 5 of the pressure booster 2 for acting on the second hydraulic chamber 38. The connecting line portion 46 subjects a fourth hydraulic chamber 45 to fuel, which is at the pressure that prevails in the differential pressure chamber 5 of the pressure booster 2. In comparison to the embodiment of the first piston 32 in the variant embodiment shown in Fig. 1, the first piston 32 here is embodied with an ~~expanded~~ **extended** length that penetrates the third hydraulic chamber 42. The face end 44 of the first piston 32 protrudes into the fourth

hydraulic chamber 45 shown in Fig. 2. Accordingly, the face end 44 of the first piston 32 can be acted upon, in the fourth hydraulic chamber 45, by the pressure that prevails in the differential pressure chamber 5.

Page 9, please replace paragraph [0032] with the following amended paragraph:

[0032] In the outset state, that is, with the second switching valve 24 closed, the control chamber 29 of the servo valve 23 is acted upon via the supply line 22 with the pressure that prevails in the high-pressure source 1 (high- pressure reservoir). Acting on the end face 28 of the second piston 33 is a closing pressure force that is higher than the pressure force acting in the opening direction from the third hydraulic chamber 42 on the face end 44 of the first piston 32. The piston combination 32, 33 is thereby moved into its lower position, so that the first sealing seat 36 is closed, and the second sealing seat 40 is opened because of the open slide edge. As a result, the differential pressure chamber 5 of the pressure booster 2 is acted upon via the second hydraulic chamber 38 via the connecting line 43 and the open flow conduit 41, with the pressure prevailing in the third hydraulic chamber 42, which corresponds to the pressure prevailing in the high-pressure source 1. As a result, the pressure booster 2 remains deactivated, since the pressure prevailing in the high-pressure source 1 also prevails in its work chamber [[5]] **4**. To assure the tightness against high pressure, a first overlapping length 37 is embodied below the pressure shoulder.

Page 10, please replace paragraph [0034] with the following amended paragraph:

[0034] If the second switching valve 24 is closed again, the piston combination 32, 33 moves into its outset position, because of the hydraulic pressure force, operative in the closing direction, in the control chamber 29 of the servo valve 23 that acts on the end face 28 of the second piston 33. Because of the hydraulic closing force, an exactly defined closing motion over the entire stroke course of the piston combination 32, 33 is established. To reinforce the closing motion, a spring force may additionally be provided, ~~which however is no longer shown~~ **for example by spring 31** in the variant embodiments of the servo valve 23 in Figs. 1 and 2.

Please replace paragraph [0035] with the following amended paragraph:

[0035] To stabilize the guidance of the piston combination 32, 33, an integrated flow ~~conduit 41 is~~ **path defined by the asymmetrical portion** embodied on the first piston 32 **over the overlap length 41** ~~of the piston combination 32, 33~~. Instead of the 3/2-way variant of the servo valve 23 shown in Figs. 1 and 2, a 2/2-way variant may be employed, or a 4/2-way variant, in which the function of the check valve 7 can be integrated with the piston combination 32, 33 of the servo valve 23.

Please delete paragraph [0037].

Please replace paragraph [0038] with the following amended paragraph:

[0038] **Fig. 3 shows a variant embodiment of a fuel injector in which the pressure booster assigned to this fuel injector is also triggered via a servo valve.** In a departure from the booster piston 3 of the pressure booster 2 used in the variant embodiments of Figs. 1 and 2, in the variant embodiment of Fig. 3 a booster piston 50 with an integrated check valve

is provided. Moreover, the subjection of the control chamber 29 of the servo valve 23 to pressure is effected via a second inlet throttle 26 that connects the work chamber 4 of the pressure booster 2 directly with the control chamber 29. This second inlet throttle is not integrated with the supply line 22 by way of which the work chamber 4 of the pressure booster 2 as shown in Fig. 3 is acted upon by the high-pressure source 1 (high-pressure reservoir).

Page 11, please replace paragraph [0040] with the following amended paragraph:

[0040] The servo valve 23 of Fig. 3 is embodied as a servo- hydraulically supported valve and includes a first valve piston ~~part~~ **portion** 32, with which a smaller-diameter second piston ~~part~~ **portion** 33 is associated. The valve piston is embodied in one piece. The servo valve 23 is activated and deactivated by actuation of the second switching valve 24. A third low-pressure-side return 25 is associated with the second switching valve 24, and by way of it the control chamber 29 of the servo valve 23 can be pressure-relieved into the third low-pressure-side return 25, with the interposition of the second outlet throttle 27.

Page 12, please replace paragraph [0043] with the following amended paragraph:

[0043] Fig. 3 shows the switching position of the servo valve 23 in which the pressure booster 2 is deactivated. In the control chamber 29, with the second switching valve 24 placed in its seat, the pressure level prevailing in the high-pressure source 1 (high-pressure reservoir) also prevails, via the second inlet throttle 26 branching off from the work chamber 4 and via the supply line 22. As a result of the pressure force engaging the end face 44 of the first valve

piston part 32, this valve piston part is pressed into its upper position, since the closing force acting on the face end 44 is greater **than** the pressure force acting in the opening direction that engages the annularly extending pressure shoulder in the third hydraulic chamber 42. In this position of the first valve piston part 32, because of the overlapping length 37, the first sealing seat 36 is closed, while conversely the second sealing seat 40 in the housing 47 of the servo valve 23 is open. Because of this, the differential pressure chamber 5 of the pressure booster 2 is subjected, via the open second sealing seat 40 and the second hydraulic chamber 38, to the pressure prevailing in the third hydraulic chamber 42, and the pressure booster 2 therefore remains deactivated.

Please replace paragraph [0044] with the following amended paragraph:

[0044] To assure adequate high-pressure tightness of the ~~second~~ **third** hydraulic chamber 42 relative to the fourth hydraulic chamber 45 on the low-pressure side and the fourth low-pressure-side return 35 branching off from it, the first overlapping length 37 is embodied on the second valve piston part 33. Because of the second valve piston part 33, the first overlapping length 37 is markedly reduced in the variant embodiment of Fig. 3, compared to the first overlapping length 37 in the variant embodiments of Figs. 1 and 2.

Please replace paragraph [0045] with the following amended paragraph:

[0045] Fig. 4 shows the activated state of the switching valve **of Fig. 3** that triggers the pressure booster of a fuel injector.

Page 13, please replace paragraph [0046] with the following amended paragraph:

[0046] Beginning in the outset state shown in Fig. 3, upon activation of the first switching valve 24 in Fig. 4, the control chamber 29 of the servo valve 23 is relieved via the second outlet throttle 27 into the third low-pressure-side return 25. The piston 32, because of the decreasing pressure in the control chamber 29, moves with its end face 44 against a stop 30. The opening motion of the first valve piston part 32 and the second valve piston part 33 is reinforced by the hydraulic opening force generated in the third hydraulic chamber 42. This hydraulic chamber communicates via the overflow line 39 with the differential pressure chamber 5 of the pressure booster 2, from which upon a pressure relief a not inconsiderable control volume flows out, via the third hydraulic chamber 42 and the fourth hydraulic chamber 45, into the fourth low-pressure-side return 35. In the ~~cold~~ **deactivated** state of the servo valve 23 as shown in Fig. 4, the second sealing seat 40 is closed, while conversely the first sealing seat 36 is open, because of the first overlapping length 37 that has moved out of the housing 47 of the servo valve 23. The differential pressure chamber 5 of the pressure booster 2 now communicates via the third hydraulic chamber 42 and the open first sealing seat 36 via the fourth hydraulic chamber 45 with the fourth low-pressure-side return **35**, so that the booster piston 50 with the integrated check valve 7 moves into the compression chamber 6 of the pressure booster 2. As a result, both the control chamber 11 of the fuel injector 9 and, via the nozzle chamber inlet 15, the nozzle chamber 14 of the fuel injector 9 are acted upon by fuel that is at elevated pressure.

Please replace paragraph [0047] with the following amended paragraph:

[0047] Upon another actuation of the second switching valve 24, that is, upon closure of the third low-pressure-side return **25**, pressure builds up in the control chamber 29 of the servo valve 23, so that the first valve piston part 32 and the second valve piston part 33 move back into the outset position shown in Fig. 3. By means of a hydraulic closing force generated in this way, a fast, exactly defined closing motion over the entire stroke course of the valve piston with the first valve piston part 32 and the second valve piston part 33 is attained in the servo valve 23. To reinforce the closing motion, spring elements may be provided in the control chamber 29 of the servo valve 23.

Page 14, please replace paragraph [0050] with the following amended paragraph:

[0050] The variant embodiment of the servo valve 23 shown in Fig. 5 is in its outset state, that is, its closed position. The pressure booster 2 shown in the variant embodiment of Fig. 5 is equivalent to the version of the pressure booster in Figs. 3 and 4 with an integrated check valve 7. The fuel injector 9 is embodied ~~identically~~ analogously to the fuel injectors already described in conjunction with Figs. 1, 2, 3, and 4.

Please replace paragraph [0051] with the following amended paragraph:

[0051] In the departure from the variant embodiments shown thus far of the servo valve 23 ~~proposed according to the invention,~~ the servo valve 23 **of Fig. 5** includes a multi-part housing 61, ~~which~~ **including** a first housing part 62, from which the fourth low-pressure-side return 35 branches off, and a second housing part 63, which receives the one-piece valve piston **60** of the servo valve 23. The valve piston 60 includes a first valve piston part 32 and a

reduced-diameter valve piston part **(unnumbered)**. Diametrically opposite the end face 28 of the reduced-diameter valve piston part, a further seal 64 is embodied on the underside of the first housing part 62 of the multi-part housing 61. The seal 64 may be embodied as a flat seat, conical seat, or ball seat. One or more flow conduits 41 are disposed on the circumference of the reduced-diameter valve piston part. The overlapping length 37 on the outer circumference of the reduced-diameter **part of** valve piston 60 is further reduced, in comparison to the overlapping lengths 37 of the second valve piston part 33 as shown in Figs. 3 and 4.

Page 15, please replace paragraph [0052] with the following amended paragraph:

[0052] In the outset state shown in Fig. 5, that is, in this switching position of the servo valve 23, the pressure level prevailing in the high-pressure source prevails in the control chamber 29 of the servo valve 23, via the second inlet throttle 26, the work chamber 4 of the pressure booster 2, and the supply line 22 that branches off from the high- pressure source (high-pressure reservoir). The second switching valve 24 closes the third low-pressure-side return 25. Because of the pressure prevailing in the control chamber 29, a pressure force acting in the closing direction acts on the face end 44 of the first valve piston part 32. This pressure is greater than the pressure force operative in the opening direction that acts on the annular face in the third hydraulic chamber 42 on the first valve piston part 32, so that the first valve piston part 32 is put into the position shown in Fig. 5, ~~sealing off~~ **seating** the seal 64. In this position of the valve piston 60 of the servo valve 23, the first sealing seat 36 is closed, while conversely the second sealing seat 40, embodied as a slide seal, is open. Because of the sealing of the fourth hydraulic chamber 45 by the closed seal 64, when the servo valve 23 is

closed no leakage flow into the fourth low-pressure-side return 35 arises. As a result, lesser demands of the reference leakage can be allowed with respect to the guide length and the acceptable play at the first overlapping length 37.

Please replace paragraph [0053] with the following amended paragraph:

[0053] The seal 64 can be embodied in manifold ways that can be represented as a flat seat, conical seat or ball seat. Embodying the seal 64 as a flat seat in conjunction with a multi-part housing 61 of the servo valve 23 is particularly advantageous. If the seal 64 is embodied in particular as a flat seat in a separate housing part 62, then any axial offset that may occur between the valve piston 60 of the servo valve 23 and the housing **part** 62 can be compensated for. With the structural form of the servo valve 23 as shown in Fig. 5, a strong closing force, which improves the sealing action, is brought to bear on the valve piston 60 of the servo valve 23, and as a result, when the seal 64 is embodied as a flat seat, for example, a very high pressure per unit of surface area and hence a good sealing action are established.

Page 18, please add the following new paragraph after paragraph [0059]:

[0060] The foregoing relates to a preferred exemplary embodiment of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.

Please delete pages 20, 21 and 22.